

Table of Contents *(scroll or use links below to navigate document)*[What They Do](#)[Tasks](#)[Skills, Knowledge, and Abilities](#)[Work Environment](#)[California's Job Outlook and Wages](#)[Trends](#)[Training](#)[Where Do I Find the Job?](#)[Where Can the Job Lead?](#)[Other Sources](#)[View Career Video](#)**What They Do**

Mechanical Engineers design, produce, maintain, and improve all kinds of mechanical devices, components, engines, and systems. Examples include transportation equipment, environmental control systems, materials handling systems, machine tools, robots, and automated manufacturing equipment. Mechanical Engineers are also involved with power conversion systems ranging from internal combustion engines to large power-generating stations. They need to know about all forms of energy needed to produce motion or heat—solar, water, wind, and nuclear energy, as well as conventional fuels. The field is diverse, and Mechanical Engineers can work in many different areas including design, testing, manufacturing, sales, or teaching.

Manufacturing Engineers played a very important part in the creation of the mass production factories of the 1920's. Today, U.S. manufacturing industries are turning to cost-saving technologies including automated processing and robotics to improve their competitiveness and productivity. Using computer-aided design (CAD), they are developing new types of automated systems utilizing laser-processing and machining, and advanced sensor and imaging technologies. Mechanical Engineers also design and develop service, or mobile robots, and automated guided vehicles, including space exploration vehicles. Many Mechanical Engineers work in machinery and systems design. Design engineers are mainly concerned with new product development but also upgrade existing designs to achieve desired performance goals.

Mechanical Engineers who work in manufacturing are responsible for all aspects of production, from development or selection of manufacturing methods, to overseeing day-to-day operations on the factory floor. Engineers must be able to design, install, and operate complex manufacturing systems made up of people, materials, robotics, and other automated equipment. Along with this, they develop and monitor preventive maintenance programs. They may work on teams with design and/or test engineers, and often develop the product and the production process concurrently.

Tasks

- ▶ Read and interpret blueprints, technical drawings, schematics, and computer-generated reports.
- ▶ Confer with engineers and other personnel to implement operating procedures, resolve system malfunctions, and provide technical information.
- ▶ Research and analyze customer design proposals, specifications, manuals, and other data to evaluate the feasibility, cost, and maintenance requirements of designs or applications.

Mechanical Engineers

- ▶ Specify system components or direct modification of products to ensure conformance with engineering design and performance specifications.
- ▶ Research, design, evaluate, install, operate, and maintain mechanical products, equipment, systems, and processes to meet requirements, applying knowledge of engineering principles.
- ▶ Investigate equipment failures and difficulties to diagnose faulty operation and to make recommendations to maintenance crew.
- ▶ Assist drafters in developing the structural design of products, using drafting tools or computer-assisted design/drafting equipment and software.
- ▶ Provide feedback to design engineers on customer problems and needs.
- ▶ Oversee installation, operation, maintenance, and repair to ensure that machines and equipment are installed and functioning according to specifications.
- ▶ Conduct research that tests and analyzes the feasibility, design, operation, and performance of equipment, components, and systems.

Detailed descriptions of this occupation may be found in the Occupational Information Network (O*NET) at online.onetcenter.org.

Important Skills, Knowledge, and Abilities

- ▶ Mathematics — Using mathematics to solve problems.
- ▶ Complex Problem Solving — Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.
- ▶ Critical thinking — Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.
- ▶ Reading Comprehension — Understanding written sentences and paragraphs in work related documents.
- ▶ Science — Using scientific rules and methods to solve problems.
- ▶ Active Listening — Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
- ▶ Engineering and Technology — Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.
- ▶ Mechanical — Knowledge of machines and tools, including their designs, uses, repair, and maintenance.
- ▶ Design — Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models.
- ▶ Production and Processing — Knowledge of raw materials, production processes, quality control, costs, and other techniques for maximizing the effective manufacture and distribution of goods.
- ▶ Written Comprehension — The ability to read and understand information and ideas presented in writing.
- ▶ Problem Sensitivity — The ability to tell when something is wrong or is likely to go wrong. It does not involve solving the problem, only recognizing there is a problem.
- ▶ Oral Expression — The ability to communicate information and ideas in speaking so others will understand.

Mechanical Engineers

- ▶ **Deductive Reasoning** — The ability to apply general rules to specific problems to produce answers that make sense.
- ▶ **Inductive Reasoning** — The ability to combine pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events).
- ▶ **Information Ordering** — The ability to arrange things or actions in a certain order or pattern according to a specific rule or set of rules (e.g., patterns of numbers, letters, words, pictures, mathematical operations).

Work Environment

Mechanical Engineers are employed in virtually every industry, with most working for manufacturing firms. Although some engineers spend most of their time in temperature controlled, comfortable offices, many jobs require working part of the time in a plant, testing laboratory, machine shop, or installation site. Work schedules are generally 40 hours per week, although occasional project deadlines will require engineers to work overtime. Mechanical Engineers also travel to professional conferences and training sessions to keep abreast of recent advances in the field. Many belong to the American Society of Mechanical Engineers or the National Society of Professional Engineers.

California's Job Outlook and Wages

The California Outlook and Wage table below represents the occupation across all industries.

Standard Occupational Classification	Estimated Number of Workers 2004	Estimated Number of Workers 2014	Average Annual Openings	2006 Wage Range (per hour)
Mechanical Engineers				
17-2141	23,200	26,500	970	\$30.11 to \$46.38

Wages do not include self-employment.

Average annual openings include new jobs plus net replacements.

Source: www.labormarketinfo.edd.ca.gov, Employment Projections by Occupation and OES Employment & Wages by Occupation, Labor Market Information Division, Employment Development Department.

Trends

A slower-than-average growth is expected for Mechanical Engineers in California through 2014, with slight declines expected in aerospace and some manufacturing. However, an increased need for engineers hired through consulting or temporary agencies is expected to offset the decline. Replacement needs for Mechanical Engineers who retire or leave for other types of work will create the bulk of job opportunities—nearly 640 openings per year. Emerging technologies in the fields of information technology, biotechnology, and nanotechnology will create new job opportunities for Mechanical Engineers, especially those who have knowledge in biology, chemistry, information technology, or other specialties now commonly integrated into engineering projects.

Training/Requirements/Apprenticeships

A bachelor of science in mechanical engineering (BSME) or a related engineering degree is the minimum requirement for most entry-level positions. Some employers prefer a master's degree; others hire only those who have at least two years of experience.

Mechanical Engineers

Mechanical Engineers who work for manufacturing companies are not required to have a license with the California State Board of Registration for Professional Engineers; however, those who work in engineering firms, are self-employed, or otherwise work outside of manufacturing and use the title Professional Engineer or Mechanical Engineer are required to obtain a license. To become licensed, engineers must have at least a BSME degree, two years of engineering experience, and pass an eight-hour engineering exam. Another path to licensure is to pass the Engineer-in-Training exam and, later, the professional examination in mechanical engineering. Increasingly, experienced Mechanical Engineers are heading back to the classroom to update their skills and add to their knowledge of science, math, or computer science, particularly those who wish to work in fields such as biotechnology and robotics.

Recommended High School Course Work

Important college preparation classes include algebra, geometry, trigonometry, and physics. Courses in mechanical drawing and drafting, computer science, machine shop, and business administration are helpful.

Where Do I Find the Job?

Prior to graduation, students may sign up for interviews with recruiters on campus. Job seekers may also reply to ads in campus, local, or national newspapers and in professional journals. Networking through professional society meetings could also lead to jobs.

Direct application to employers remains one of the most effective job search methods.

Use the *Search for Employers by Industry* feature on the *Career Center* page at www.labormarketinfo.edd.ca.gov to locate employers in your area. Search under the following industry names to get a list of private firms and their addresses:

- ▶ Aircraft Engine and Engine Parts
- ▶ Aircraft
- ▶ Architectural Services
- ▶ Electricity & Signal Testing Instruments
- ▶ Electromedical Apparatus
- ▶ Engineering Services
- ▶ Guided Missiles and Space Vehicles
- ▶ Industrial Process Variable Instruments
- ▶ Landscape Architectural Services
- ▶ Other Aircraft Parts and Equipment
- ▶ Search, Detection, & Navigation Instruments
- ▶ Testing Laboratories

Search these **yellow page** headings for listings of private firms:

- ▶ Engineers-Consulting
- ▶ Engineers-Foundation
- ▶ Engineers-Industrial
- ▶ Engineers-Manufacturing
- ▶ Engineers-Mechanical
- ▶ Engineers-Petroleum
- ▶ Engineers-Power

Where Can the Job Lead?

Advancement opportunities exist along a structured career path for Mechanical Engineers. They can advance to a Senior or Supervising Mechanical Engineer within an organization. In some cases, they may advance to managerial positions.

Mechanical Engineers

There are many job opportunities for existing Mechanical Engineers who want to work in other specialty fields such as biotechnology or robotics. The best candidates for higher paying or more prestigious jobs are those who can demonstrate current knowledge in chemistry, biology, business, computer science, or other fields necessary in today's engineered products.

Other Sources of Information

California Board for Professional Engineers and Land Surveyors
www.dca.ca.gov/pels

American Society of Mechanical Engineers
www.asme.org

California Society of Professional Engineers
www.cspe.com

Junior Engineering Technical Society
www.jets.org

